

point source loadings had comprised up to 70% of the total nutrient input (Woodward-Clyde, 1994c). As a result of these findings and at the urging of interest groups, the state legislature determined that it would be prudent to place additional restrictions on loadings from domestic WWTPs. Therefore, the IRL Act was passed in 1990 (formerly named the IRL “No Discharge” Act in the 1994 SWIM Plan; Chapter 90-262, Laws of Florida). With certain limited exceptions, the IRL Act required the major domestic WWTPs to eliminate discharges to the IRL by 1995. By 1996, most of the WWTPs re-directed effluent discharges away from surface waters of the IRL system. Today, all WWTPs are legally in compliance with the Act according to FDEP’s Central and Southeast district offices.

In terms of annual load reductions, what progress has been achieved to reduce this point source contribution? To answer this question, let’s review the IRL WWTP inventory, which has been updated twice since its initial development in 1985. According to the 1985 WWTP inventory, there were 45 domestic facilities discharging slightly over 39 million gallons per day or 14.2 billion gallons per year of effluent to the IRL system (SJRWMD and SFWMD, 1987). In 1993, when the inventory was updated (1994 IRL SWIM Plan), the number of facilities that surface-water discharged dropped to 22 and the cumulative volume of effluent dropped to 8.4 billion gallons per year.

Now, after years of compliance with the Act, only three WWTPs – the New Smyrna Beach, Edgewater, and City of Cape Canaveral WWTPs -- are currently allowed by the state to discharge continuously, although at much reduced rates. Those three WWTPs are undergoing facility upgrades, including expansion of their reclaimed water systems, to significantly reduce effluent discharges (more details are provided in Chapter 3 for the New Smyrna Beach and Edgewater WWTPs, and in Chapter 4 for the Canaveral WWTP). All other major WWTPs in the IRL Basin that did continuously discharge prior to the Act are not doing so now, albeit “intermittent” or “wet weather” discharges as allowed under permit (up to 91 days/year or 2184 hours/year). The allowance for intermittent discharge means that up to 3.4 billion gallons of domestic WWTP effluent are *potentially* discharged to the IRL system each year. The actual discharge volume may be less. Commensurate with the step-wise reductions in effluent volumes since 1985, there have been significant reductions in the annual nutrient loading from WWTPs (Table 2-3). By 2000, the major domestic WWTPs contributed less than 2% of the annual external nutrient loading to the IRL.

Table 2-3. Estimated Lagoon-wide Loads of Nitrogen, Phosphorus, & Suspended Solids from Domestic WWTPs

	Total Nitrogen lb/yr	Total Phosphorus lb/yr	Total Suspended Solids lb/yr
1985	1,763,700	418,400	1,521,200
1993	1,064,800	244,700	897,300
2000	137,314*	16,267*	43,320*

*In 2000, most of the domestic WWTP loading to the IRL system was contributed by the New Smyrna and Edgewater WWTPs (64% of TN, 59% of TP, and 68% of TSS loadings). These WWTPs are planning further effluent reductions.

Land Acquisition and Management. Acquiring lands is an important strategy to protect or restore wetlands, but it can also be effective in mitigating pollutant loads – present and future. This strategy is largely pursued through the IRL *Blueway* program. The *Blueway* program, its scope and progress, is described in the sections on Coastal Wetlands found in this and the following chapters.

In addition, other lands are sought for the purpose of constructing and operating surface water storage/treatment systems (mostly in the Central and South IRL). For example, the Districts can assist local governments in acquiring lands that would be a necessary prerequisite to constructing municipal or regional stormwater treatment systems. And, of course, upland parcels purchased as a means of acquiring wetlands can be preserved or managed in ways that will preclude or minimize development and future pollutant load increases.

Land acquisition today, however, is a far greater financial challenge than during the 1990s. State funds dedicated to land acquisition are dwindling. The Districts will not be able to acquire as much land on their own, thus making funding partnerships a practical necessity. In fact, *joint* land purchases for the purpose of water management projects are preferred. Typically, the acquisition partner is a local jurisdiction that would be responsible for operation and maintenance following facility construction.

Details on specific purchases are found in the following chapters, particularly in chapters dealing with the North and Central IRL, South IRL, and St. Lucie River watershed (Chapters 5 - 7), where most of the acquisitions are located.

The Next 5 Years – Lagoon-wide Projects

Taking stock of the program's progress and what we know about the current status of seagrass and water quality, project work over the next 5 years can be planned to further the monitoring, diagnostics, and development of restoration targets and strategies.

Lagoon-wide Monitoring and Diagnostics. Lagoon-wide assessments and resource target development (e.g., seagrass targets, PLRGs) would be well served by continuing the various, long-term monitoring activities described at the beginning of this chapter. Both Districts will continue to periodically review the effectiveness and efficiencies of their monitoring projects. Further enhancements of the water quality and seagrass monitoring networks will always be considered to achieve stronger statistical relationships among the field data collected from both networks. Another potential enhancement that will be evaluated is the use of hyperspectral digital imagery as a rapid and cost-effective means to map seagrasses Lagoon-wide, and to differentiate drift macroalgae from seagrasses. This technology may also prove to be an effective monitoring tool with respect to quantifying the Lagoon's turbidity/light attenuation characteristics. In summary, the monitoring networks listed below (Table 2-4) should continue indefinitely, not just over the next 5 years.

Pollutant Load Reduction Goals & Related Modeling Efforts. The SJRWMD and SFWMD estuarine models are presently undergoing final validation using measurement data from the IRL and its tributaries. In 2003, the SJRWMD will begin to apply its estuarine model (a.k.a. Pollutant Load Reduction or PLR Model) in the evaluation of provisional PLRGs, and revising them as necessary to develop recommended final

PLRGs in the Central IRL followed by Banana River Lagoon (with emphasis on its southern end), and other sub-Lagoons (Table 2-2).

Table 2-4. Lagoon-wide Monitoring Activities to be Continued Over the Next 5 Years

- **Water Quality Monitoring Network**
SJRWMD and partner agencies – Mosquito & Banana R. Lagoons, and N. & Central IRL
SFWMD – South IRL and St. Lucie River
- **Seagrass Monitoring Network**
SJRWMD, SFWMD, other agencies, and volunteers conduct various measurements of seagrass abundance, diversity, and ancillary environmental conditions throughout the IRL
- **Seagrass Mapping and Aerial Photography**
SJRWMD and SFWMD annual contracts for Lagoon-wide aerial photography and biennial mapping of seagrass coverages; evaluation of a hyperspectral map method
- **Hydrological and Meteorological Monitoring of Major Sub-basins**
SJRWMD, USGS, contractors – Mosquito & Banana R. Lagoons, North & Central IRL
SFWMD, USGS, FDEP, contractors – South IRL and St. Lucie River
- **Hydrodynamic Monitoring**
SJRWMD, SFWMD, FDEP conduct measurements (e.g., current velocity, conductivity, water elevation, temperature) at several, strategic locations in the IRL system
- **Atmospheric Nutrient Deposition**
SJRWMD collects data at a Volusia County site and at Sebastian Inlet (partially supported by funds from the EPA CASTnet and NEP).

SFWMD has developed hydrologic, water quality and hydrodynamic (estuarine) models for the South IRL and St. Lucie River Estuary (SLE). Enhancements of these models are underway with an emphasis on linking the watershed and estuarine water quality models in order to predict estuarine water quality conditions as a function of external inputs and internal hydrodynamics and other processes. Full development of these models and their interconnections are due by the end of 2003²⁰.

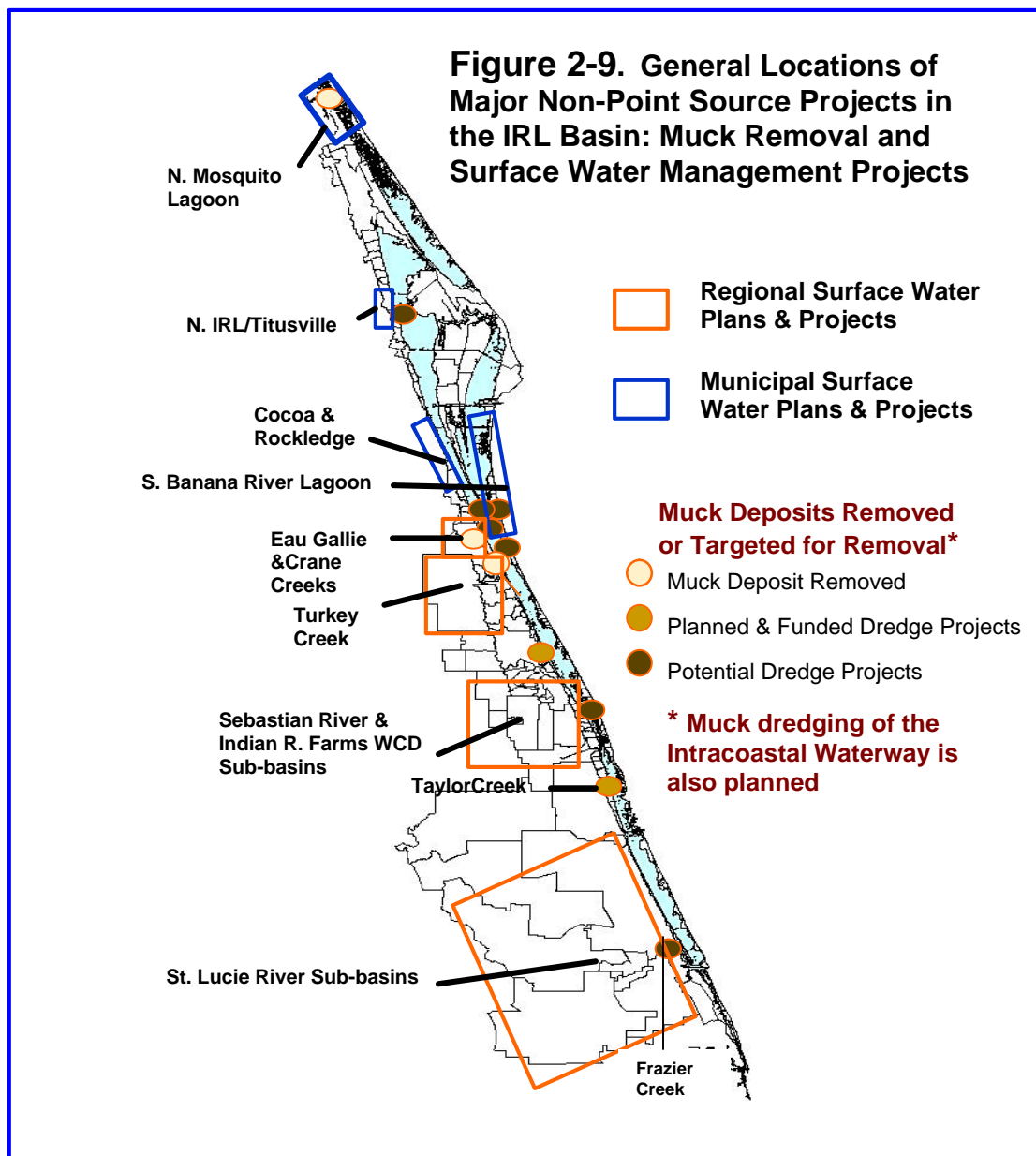
As stated before, both Districts in collaboration with the U.S. Army Corps of Engineers (USACE), and as part of the IRL-North and IRL-South Feasibility Studies, will also utilize sub-basin watershed models where necessary to enhance the calibration of the estuary models, to evaluate and determine the allocation of pollutant load reduction levels among the sub-basins, and to test the feasibility of water storage and treatment alternatives. The 5-year schedule for development and application of sub-basin models is consistent with the PLRG development schedule for the priority sub-basins (see Table 2-2). The Districts will forward their respective, final recommended PLRGs to FDEP for consideration in the development of TMDLs (see Appendix A, TMDL process)

General Management Strategies for Pollutant Load Reduction.

General Non-Point Source Strategies. With respect to a 5-year plan for the reduction of *non-point* source pollution, both Districts will generally “stay the course” on implementing their *surface water storage/treatment projects* as they were generally described in the 1994 IRL SWIM Plan. More focus and detail in strategic planning has occurred since 1994, which is summarized in this SWIM plan update, the IRL-South Feasibility Study Report (USACE and SFWMD, 2001), and the IRL-North Feasibility Study Project Management

²⁰ Refer to www.sfwmd.gov/org/wrp/wrp_ce/projects/2_wrp_ce_projects.html and www.evergladesplan.org/pm/studies/irl/irl_impact_statements.html (Appendix B) for more information on these South IRL and SLE models.

Plan (USACE and SJRWMD, 2002). The overarching management strategy emphasizes continuation of cooperative, cost-share programs with local governments and with the USACE for construction and operation of surface water treatment projects, particularly on a regional scale in the high priority sub-basins (Figure 2-9).



These high priority sub-basins and associated Lagoon segments merit additional surface water and pollutant load reduction controls for the following reasons: (1) the status assessment of seagrasses and water quality generally indicates greater environmental stress, especially in the Central IRL (including the southernmost segment of Banana River Lagoon), and the St. Lucie River and adjacent segments of the South IRL, (2) a majority of the effort and funding on behalf of the Districts and partner agencies have already been invested in these areas (since 1989), and (3) the potential for further environmental harm in those areas is still great based on rates of population growth, and related development and drainage impacts.

Muck removal²¹ coupled with the control of upland muck sources is an important two-fold strategy toward reducing significant sources of nutrients and turbidity in the IRL. Again, the Central and South IRL are the two major target areas simply because they contain most of the major deposits of muck. The Districts have identified specific muck deposits slated for removal between the 1995 and 2010: Eau Gallie River, Sebastian River, Taylor Creek (C-25 sub-basin), and in Wiloughby and Poppleton Creeks (tributaries to the St. Lucie River). In addition, the USACE and FIND are co-sponsors of a 10-year 'environmental' maintenance dredging of the Intracoastal Waterway channel, which contains about 60 to 70% of the muck in the Indian River Lagoon proper.

General Point Source Strategy. The Florida Department of Environmental Protection (FDEP) will continue to monitor the *major domestic WWTPs* for compliance with the Indian River Lagoon Protection Act and conditions associated with permits issued under the requirements of the Act. Both the FDEP and SJRWMD will continue to assess the facility upgrades and corresponding effluent reductions in progress at the New Smyrna Beach, Edgewater, and City of Canaveral WWTPs. They are the only major domestic WWTPs that continuously discharge and, thus, constitute major point-source nutrient loadings to the Mosquito and Banana River Lagoons. The Districts will also continue to update the Lagoon-wide WWTP point source inventory every 5 years.

Presently, the Districts and the IRLNEP are paying closer attention to reverse osmosis (RO) water treatment facilities and the quality of the effluents they discharge to the IRL. The impacts of RO discharges (e.g., salinity and nutrient levels) are reviewed by FDEP but will also be considered by the Districts when these facilities apply for consumptive use permits. It is the intent of the Districts to have RO facilities utilize the best technology available to minimize loading of N, P, and other constituents that could create localized impacts in the Lagoon. Toward that end, cooperation by facility owners and FDEP during these assessments will be encouraged to engender consensus on the best methods or course of action to be taken by RO facilities.

Land Acquisition and Management. SJRWMD and its *Blueway* partners will strive toward an annual acquisition rate of 20% of the 450 parcels identified. Therefore, all available *Blueway* parcels (with willing sellers) may be acquired by 2006. Acquiring such properties will help lessen development impact on the coastal wetlands shorelines and nearby seagrass beds (and allow rehabilitation of impounded wetlands; see Coastal Wetlands section).

Upland parcels will be identified in the priority sub-basins (Sebastian, Indian River Farms WCD, C-25 and St. Lucie sub-basins, etc.) for sites suitable for constructing either municipal-scale or regional-scale surface water storage and/or treatment facilities. Such uplands are deemed generally suitable if they are strategically located within the watershed and do not contain land, ownership, or permitting characteristics that may require enormous up-front costs before construction even begins.

The SFWMD and the USACE, through the IRL-South Feasibility Study, have selected specific land areas that will be required for construction and operation of large surface water treatment and storage systems in the South IRL and St. Lucie River watersheds.

²¹ The muck proposed for removal is basically displaced topsoil (good to excellent soil amendment properties) and free of contamination; therefore, beneficial uses of this sediment should be explored.

The projected cost for the acquiring these lands is between \$400 million and \$500 million. The SJRWMD and the USACE have recently partnered to undertake the IRL-North Feasibility Study and may also identify lands, primarily in the Central IRL, over the next 3 years for the same purpose. Further description of the IRL-South and IRL-North Feasibility Studies is provided below.

USACE and the Districts (IRL-South and IRL-North Feasibility Studies). The USACE has partnered with SFWMD and SJRWMD to conduct the IRL-South Feasibility Study (F.S.) in South IRL/St. Lucie River sub-basins²² and the IRL-North F.S. in the SJRWMD portion of the IRL system. These joint programs, managed under the Comprehensive Everglades Restoration Plan, have the potential of drawing down hundreds of millions of dollars from the federal government under the re-authorization of the Water Resources Development Act (WRDA). The IRL-South F.S. is completed, and its proposed projects are scheduled for funding consideration under WRDA re-authorization in 2004. The IRL-North F.S. started in mid-2002 and is scheduled for completion by 2008. Under the feasibility studies, the USACE and the Districts will propose restoration strategies that are considered effective in meeting restoration targets and are technologically feasible at a reasonable cost. More information on the background and purpose of these feasibility studies is found in Chapter 1, pp. 8 - 9.

Water storage reservoirs and treatment areas intended to attenuate canal discharges and reduce pollutant loadings are options being seriously considered in the IRL-South project area. In both the IRL-South and -North project areas muck removal and source control projects are viewed as excellent opportunities for direct USACE involvement, particularly in the application of erosion controls along the miles of canal side-banks found in the water control districts, and in the removal of muck sediments from canals, the Intracoastal Waterway, and other navigational channels. The IRL-North F.S. will evaluate drainage infrastructure improvements, particularly in the water control districts, to both treat and attenuate discharges to the IRL. Additionally, the creation of more or larger openings through causeway bridges and the deepening of Sebastian Inlet as means toward increasing IRL flushing rates are alternatives that will be explored under the IRL-North F.S.

Summary of Lagoon-wide Seagrass and Water Quality Projects Planned for the Next 5 Years. Table 2-5 below provides a summary list of the projects or general strategies that have Lagoon-wide application and are planned for the next 5 years (2002 – 2007). The continuation of these projects is imperative in order to conduct periodic resource status assessments, complete or refine PLRGs, preserve environmentally critical wetlands and uplands, and design and construct surface water storage and treatment projects. For additional information about how many of these projects are being conducted or planned in the specific sub-Lagoons and sub-basins, please refer to the chapters that follow.

²² Please access www.evergladesplan.org for more information about the IRL-South and IRL-North Feasibility Studies.

Table 2-5. The 5-Year Plan List of Seagrass and Water Quality Strategies and Projects that have Lagoon-wide Application

- **Continuation of Lagoon-wide Monitoring Projects***
 - Water Quality Monitoring Network
 - Seagrass Mapping and Field Monitoring
 - Hydrological and Meteorological Monitoring of Major Sub-basins
 - Hydrodynamic Monitoring Network
 - Atmospheric Nutrient Deposition Monitoring
- **Development of final recommended PLRGs**
- **Application of estuary and watershed models in evaluating restoration options**
- **Design and construction of surface water storage and/or treatment areas (regional/watershed and local non-point source control)**
- **Muck source control (via watershed erosion control programs)**
- **Continuation of muck removal projects**
- **Periodic inventory of domestic WWTP effluents**
- **Continuation of the *Blueway* land acquisition program**
- **South IRL & North IRL Feasibility Studies & recommended implementation under the Comprehensive Everglades Conservation Plan (CERP)**
- **Districts' review of local comprehensive growth plans and amendments to ensure consistency with SWIM water quality and seagrass resource objectives**

* see descriptions of monitoring projects in Table 2-4 above

Coastal Wetlands

Coastal wetlands – salt marshes and mangrove swamps -- provide a vast array of ecosystem functions. They serve as links and buffers between land and open water where eroded soils and nutrients from uplands are trapped and assimilated. They provide habitat for large numbers of animals (especially fish and birds), and, as such, are crucial for sustaining Lagoon biodiversity. Wetlands are a source of particulate and dissolved organic materials for adjacent Lagoon waters, supporting estuarine fisheries production. Coastal wetlands also moderate storm/flood damage to upland areas. Many of these functions are dependent on local hydrology and hydrologic links to the estuary.

The Districts address coastal wetland management in four areas:

- Rehabilitation of impacted wetlands, primarily the reconnection of impounded wetlands
- Promotion of holistic or ecologically balanced management of reconnected wetlands
- Preservation of existing, undisturbed wetlands
- Creation of shoreline vegetative habitats

Projects and Progress to Date

Rehabilitation or Restoration²³ of Impounded Wetlands. Between the 1950s and 1970s, nearly 75% of the coastal wetlands in the IRL basin (about 40,420 of the total 53,890 acres) were impounded for mosquito control and, consequently, were isolated from the IRL system. The majority of this acreage, about 28,000 acres, is found within a Federal park and refuge covering expansive areas of northern Merritt Island, southern Mosquito Lagoon, and northern Banana River and Indian River Lagoons (Figure 2-10).

Research conducted in the 1970s and 1980s demonstrated the ecological benefits of reconnecting wetlands to the estuary (Brockmeyer et al., 1997). This *a priori* research prompted an aggressive District campaign to reconnect impounded wetlands (Virstein and Steward, 1993). This campaign began in 1990 and has been a top SWIM priority ever since. Impoundment reconnections quickly accelerated in the early 1990s. Details on this early progress can be reviewed in the 1994 IRL SWIM Plan.

Since 1994, more than 13,000 acres of impounded wetlands Lagoon-wide have been reconnected. Adding the pre-1994 acreage to that total provides a Lagoon-wide tally of slightly more than 27,500 impoundment acres that are reconnected, breached, or restored (accomplished via non-SWIM and SWIM efforts, Figure 2-10).

Within the SFWMD portion of the IRL basin, approximately 4,695 acres are now reconnected (pre-SWIM and SWIM). The SFWMD reconnection target is 4,943 acres in the South IRL. Only three impoundments, totaling 248 acres, remain isolated; and those are targeted for reconnection contingent upon their acquisition or other favorable negotiations with the private owners.

Within SJRWMD, reconnections have rehabilitated over 23,000 acres of IRL wetlands (non-SWIM: 4,500 acres, and SWIM: 18,555 acres). The goal is 33,000 acres within SJRWMD. However, reconnecting most of the remaining 10,000 acres will not be a simple matter.

Most of the remaining isolated wetlands are located in northern Merritt Island²⁴; the rest are privately owned impoundments in Brevard and Indian River counties. In northern Merritt Island, there has been a recent slow-down in reconnection progress attributable to the on-going development of a wetland mitigation plan by NASA (the land owner) and unresolved management issues with U.S. Fish and Wildlife Service (the land manager). The first issue will be rectified when the mitigation plan is completed and accepted by the SJRWMD. The latter issue is being addressed through increased interagency communication and applied research (i.e., Wetlands Management Research Initiative) based on a mutual agreement between SJRWMD, U.S. Fish and Wildlife Service, and NASA.

²³ Where feasible, efforts to restore wetlands may consist of complete removal of impoundment dikes, filling in ditches, and grading the surface to natural marsh elevations. This may be feasible where hydrologic manipulation of the wetland is not required for mosquito control or bird management. Otherwise, partial hydrologic restoration or rehabilitation of the wetland, via controlled openings through impoundment dikes, is the next best option.

²⁴ These impoundments are managed by the U.S. Fish and Wildlife Service; most are in the Merritt Island National Wildlife Refuge.

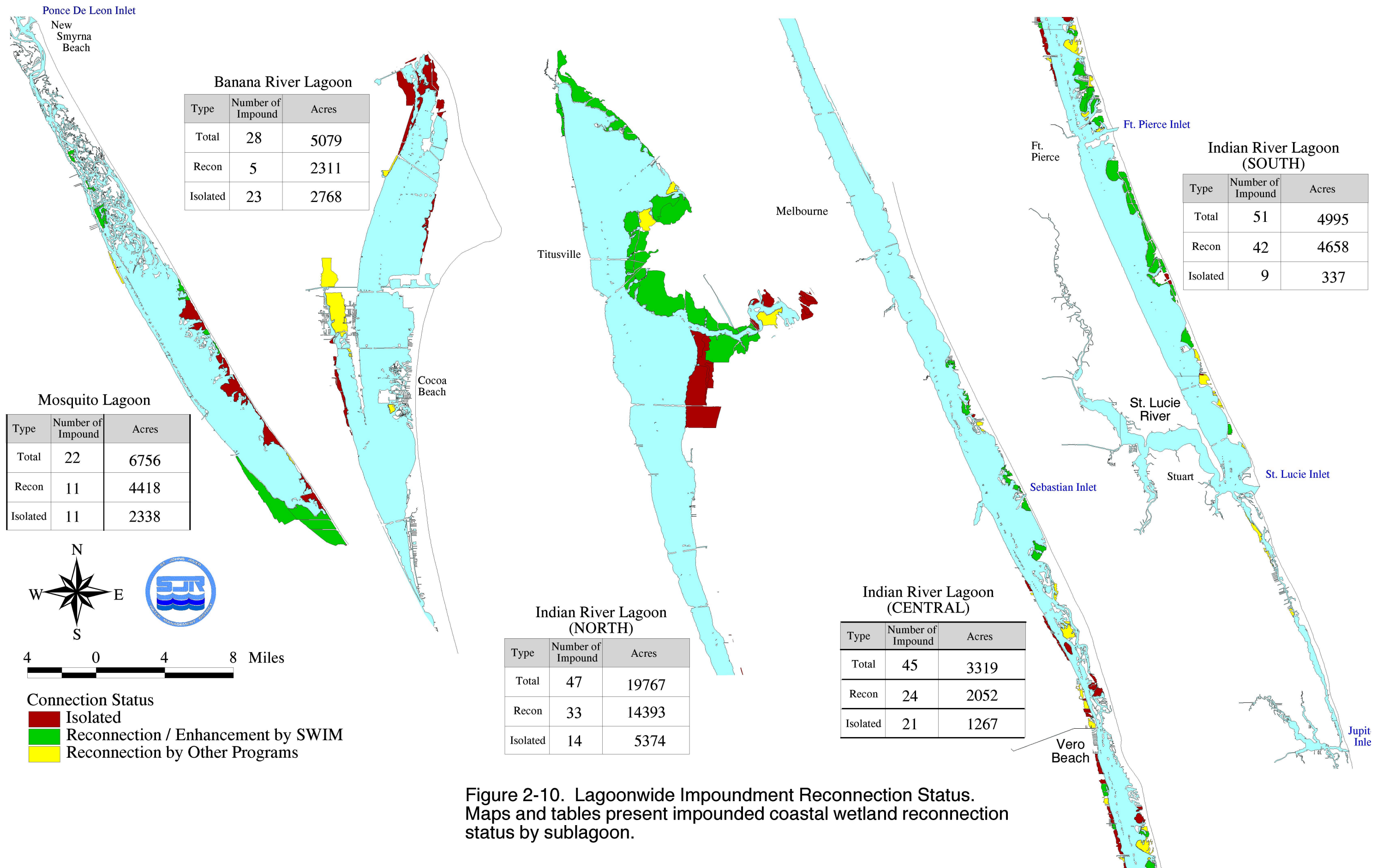


Figure 2-10. Lagoonwide Impoundment Reconnection Status. Maps and tables present impounded coastal wetland reconnection status by sublagoon.

The problem with private ownership of wetland impoundments is being addressed by a multi-agency land acquisition effort spearheaded by SJRWMD. This effort is known as the Indian River Lagoon *Blueway* Project. The *Blueway* Project targets wetlands in need of restoration as well as relatively undisturbed wetlands that need preservation. FDEP, both Districts, all counties in the IRL basin, and The Nature Conservancy are engaged in the *Blueway* Project.

Wetlands Management Research Initiative. The Wetlands Management Research Initiative, conducted in the Merritt Island National Wildlife Refuge (MINWR), is a logical response to an inter-agency debate about what constitutes appropriate management of reconnected impoundments. For example, a large percentage of reconnected impoundments in the MINWR are closed off from the Lagoon system for longer than 8 months for waterfowl and wading bird management (a.k.a. Wildlife/Aquatic Management or WAM). WAM impacts marsh vegetation and invertebrates and prevents estuarine fish from recruiting to these wetlands during the long closure period. An alternative management technique, popular with the mosquito control agencies, allows the impoundment to be open for 8 to 9 months, but must be closed and flooded during the summer months. This technique known as Rotational Impoundment Management or RIM is effective in controlling the salt marsh mosquito and does allow a longer period of exchange with the Lagoon than does WAM, but also has its drawbacks. RIM may also impact marsh invertebrates and restrict access for some species of fish that recruit to wetlands during RIM's shorter closure period. Where mosquito control is not imperative, then the merits of WAM vs. open management are also debatable.

Therefore, the Wetlands Management Research Initiative was conceived as the primary means to address, if not wholly quell, the debate. The objectives of the Initiative are:

- (1) to investigate the effects of the three management techniques – WAM, RIM, and open management – on several functions and features of impoundments and the adjacent Lagoon²⁵, and
- (2) to determine the best management alternative or mix of management techniques that best serve both the natural wetland functions of impoundments and the management mandates of USFWS and the mosquito control districts.

The 3-year Initiative is underway; the first year of research will be completed by the time this plan update is published. It is being generously funded by EPA (~\$550,000), and is cost-shared by SJRWMD, FDEP Bureau of Survey and Mapping, USGS, USFWS, and a host of other entities engaged in the research.

Rehabilitation of Other Impacted Wetlands. Most of the wetlands in the IRL that were spared from impounding are, unfortunately, still impacted in another way. These wetlands were crisscrossed with about 200 miles of mosquito control ditches. Large excavation equipment called draglines were used to ditch through 2,000+ acres of wetlands, most of it during the 1960s. (Draglines were used to construct many of the impoundments as well.) By 1970, these wetlands were altered almost beyond recognition, scarred with deep wide ditches and spoil piles. Most of these ditched wetlands are in northern and central Mosquito Lagoon, Volusia County.

²⁵ Wetland and IRL components investigated include: marsh sediment elevation, plant distributions, nutrient cycling, fish and invertebrate populations, seagrass, and populations of wading birds, waterfowl, and shorebirds.

Rehabilitation of these impacted wetlands was initiated as a pilot project with the cooperation of E. Volusia Mosquito Control District. The project is evaluating several equipment and technique options on a 56-acre ditched wetland. Successful techniques developed in the pilot project will be applied throughout the SJRWMD portion of the IRL. A plan for full-scale operations will be developed following the outcome of the pilot project.

Creation of Shoreline Vegetative Habitats. Under SWIM, wetland planting projects began in 1991. Nearly all plantings targeted the shorelines to protect them and the adjacent uplands from erosion and to reduce the loading of eroded material to the Lagoon. Alterations to the natural landscape (e.g., causeways, spoil islands) may make certain sites potential candidate sites for plantings. These sites may need to be made suitable by slope grading, installing wave barriers, or other site modifications that could increase the margin of success for plantings.

Conventional Plantings. From 1991 to 1995, planting material was typically a mix of red and black mangroves (*Rhizophora mangle* and *Avicennia germinans*) dominated by smooth cordgrass (*Spartina alterniflora*). These plants were placed directly in the ground around the mean high water mark. The major sites were spoil islands in Indian River and Brevard counties, the delta at the end of the South Relief Canal in Indian River County, and an area near the boat ramp in the Sebastian Inlet Park south of the Inlet. Other minor plantings were Watershed Action Committee (WAC) project sites dotting the IRL from central Brevard County south to St. Lucie County.

Routine monitoring of the plantings was conducted. In general, these plantings were not very successful. By the end of the monitoring (2 to 3 years), most sites had less than 5% survival of the planted material, some sites much less. Only those plants most protected from wind and waves survived, which was probably the case at one site that has been exceptionally successful -- the delta site at South Relief Canal in Indian River County.

At the South Relief Canal delta site, over 10,000 cordgrass plugs and 500 mangrove seedlings were planted in 80-ft wide bands. After 3 years, the cordgrass plugs had grown into a continuous bed of vegetation. The mangroves that were planted among the plugs were protected and are maturing. A low berm of sand had formed around the planting site, likely from strong wave action. Both the vegetation and berm appear to have stabilized the previously unconsolidated sediments of the delta. As a result, a new marsh, nearly 2.5 acres in size, is now established and appears to be fully functional habitat.

The conclusion drawn from these conventional shoreline planting experiences (i.e., plants placed directly in the sediments at the high water mark) is that the best chance for success may be achieved with broad rows of plantings where a major portion of the plantings are buffered from wave action. However, there are few sites in the IRL with the suitable characteristics for such plantings. Presently, the conventional mangrove plantings of the early years have been replaced by a new experimental technique: the encased mangrove planting method.

Encased Mangrove Planting. The latest development in an IRL shoreline/wetland planting technique is the PVC-encased mangrove planting method. The method is the innovation of Robert Riley and is called the Riley Encased Methodology or REM. Red mangrove propagules are planted within 2 to 3 ft lengths of thin-walled PVC pipe, which are inserted into the sediment. The pipe protects the young plant from wind and wave

action along the shoreline, enabling the mature mangrove to grow beyond its protective enclosure. Details on REM are available on Riley's web page: www.mangrove.org.

This innovative method was the catalyst that re-forged the IRL shoreline planting project as a multi-agency endeavor with volunteer participation. To date, a partnership of agencies and the Indian River County Environmental Learning Center (ELC) have planted more than 10,000 red mangroves utilizing REM and 1,700 hours of volunteer labor at 28 sites, which affects several thousand feet of shoreline throughout Central and South IRL. The project is supported by SJRWMD, SFWMD, IRLNEP, U.S. Fish & Wildlife Service (South Florida Coastal Ecosystem Program), Florida Inland Navigation District, and FDEP (Aquatic Preserve Program). The project is coordinated by the ELC and is largely dependent upon volunteer participation for its implementation. To learn more about this mangrove planting project, please access the ELC web page: www.elcweb.org/shoreline/.

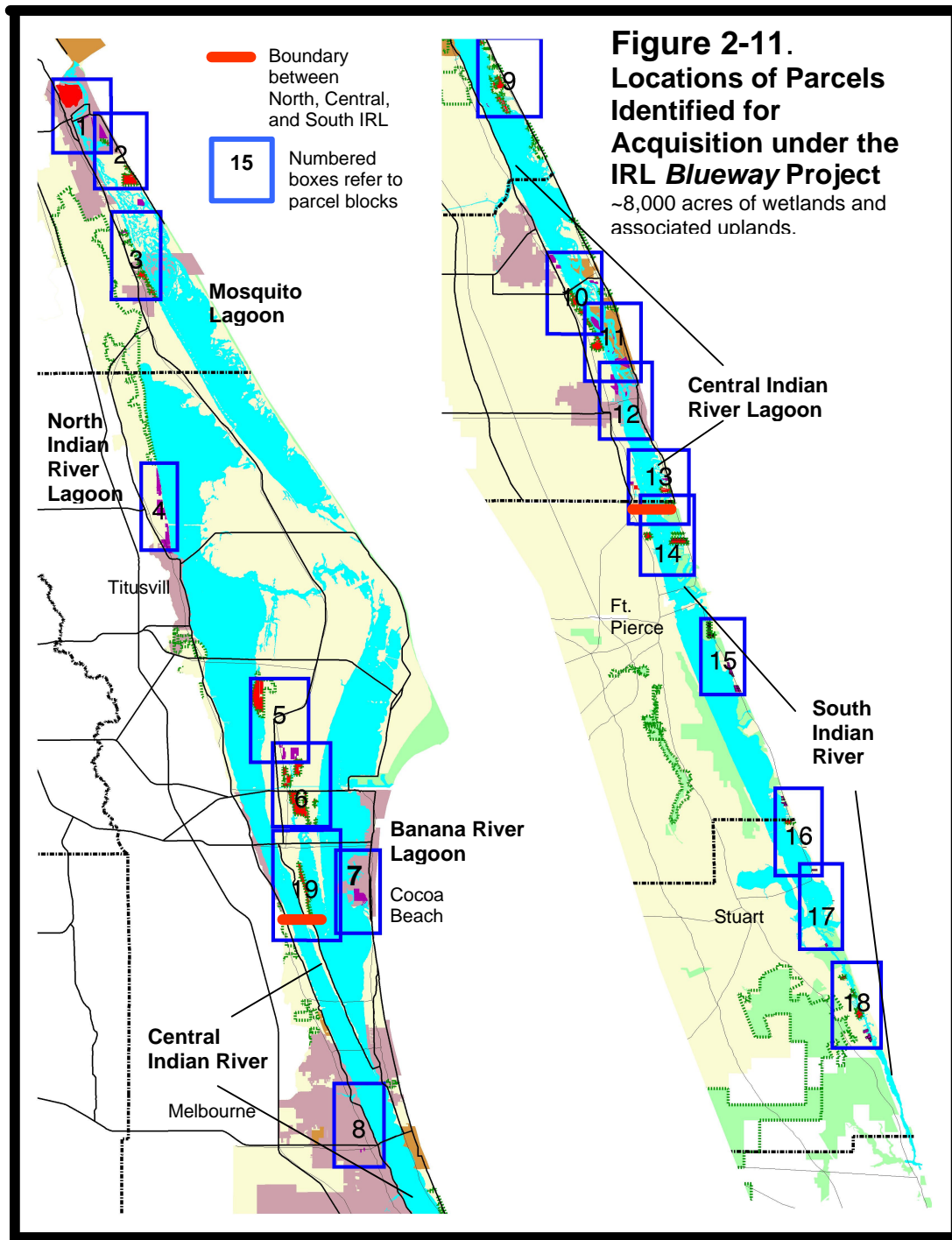
Preservation of Existing Wetlands – Land Acquisition. Land acquisition is a highly popular and successful means of preserving or protecting coastal wetlands. Early in the SWIM program, a SJRWMD acquisition plan, developed upon the data generated by Gurr & Associates (1990), identified critical lands that could help meet SWIM objectives, both for wetland and seagrass protection. In addition, the SJRWMD, FDEP, and local advocates were successful in dedicating state funds to support the Sebastian River and North Indian River CARL projects. Additional details on these projects are found in the 1994 IRL SWIM Plan (pp. 66-67).

From 1995 to 1996, the SJRWMD land acquisition plan for the IRL was used in the preparation and planning for a major proposal known as the IRL *Blueway* acquisition plan (capitalizing on the “greenway” concept, but emphasizing the connectivity of the parcels via waters of the Lagoon). This ambitious planning effort eventually included other agencies: SFWMD; Volusia, Brevard, Indian River, St. Lucie and Martin Counties; and The Nature Conservancy (TNC).

The plan goal is simple and direct -- to acquire all of the IRL wetlands identified as critical by the participating agencies. The agencies identified over 8,000 acres (~600 parcels) in the *Blueway* plan (Figure 2-11). The *Blueway* Project will achieve the SWIM objectives of “preservation of existing wetlands” and allow major advances toward the “restoration / rehabilitation of impacted wetlands.”

By 1998, *Blueway* acquisitions were being actively pursued. In SJRWMD, some land parcels in the Sebastian River CARL project area were purchased (part of the Sebastian Buffer Preserve lands whose acquisition pre-dates the *Blueway* program). Also, a few parcels in and adjacent to impoundments were acquired (e.g., Church property near John Smith impoundment and the Pine Island property, both in Brevard County and shown in parcel blocks 5 and 10 in Figure 2-11).

The SFWMD, St. Lucie County, and Martin County have collectively acquired several parcels: Bear Point Sanctuary, Vitolo Family Park, Blind Creek Park (Ocean to IRL), Ocean Bay, Queens Island, and Kings Island. Imminent closures on land include Pepper Park Addition, Avalon Addition III, and Bear Point Addition. SFWMD and FDEP jointly purchased lands as part of the North Fork St. Lucie River Buffer Preserve. A wetland mitigation bank concerning Bear Point is in the permit review stage. And, St. Lucie County Mosquito Control District directs a land acquisition and preservation program, which has succeeded in placing over 55% of the County's coastal barrier island under public ownership.



Next 5 Years – Lagoon-wide Perspective

Rehabilitation or Restoration of Impounded Wetlands. The ultimate goal is to restore or rehabilitate 33,000 acres within the SJRWMD portion of the IRL basin. To date, slightly over 23,000 acres have been rehabilitated under the SWIM initiative. Over the next 5 years, the SJRWMD plans on reconnecting another 3,000 acres of impounded coastal wetlands. It is anticipated that the regulatory directed mitigation plan affecting NASA-owned impoundments (Merritt Island) and the acquisition of privately

owned impoundments will make it possible to reconnect those wetlands, and by 2010 the remaining 7,000 acres.

In the South IRL, the majority of impoundments have either been breached or reconnected. Approximately 300 acres of impounded wetlands remain isolated (contained within 3 impoundments in St. Lucie County), comprising only 6% of the total impounded acreage in the South IRL. Those isolated impoundments will be reconnected or breached when they are either publicly acquired or the owners grant permission (note: ~53 acres may never be reconnected because of their location and use within the St. Lucie nuclear power facility).

Wetlands Management Research Initiative. This research initiative will take a minimum of three years to complete. Data collection should be completed by 2003. The analysis and report recommendations will take another year because of the comprehensive scope of the project. By 2003/04, the agencies involved will be engaged in a consensus process, probably a series of workshops and informal discussions intended to develop a “master” set of recommendations for best management of reconnected impoundments that can be applied throughout the IRL system. Achieving a consensus on these recommendations will require much interagency consultation and cooperation. It will be a difficult process given the large number of agencies involved and the importance of the issues at stake, so setting a date for final agreement on a set of recommendations is not practical nor necessary at this time.

Rehabilitation of Other Impacted Wetlands. The SJRWMD is targeting 2,000 acres of dragline-ditched wetlands for rehabilitation work. The first step is to complete the pilot project work evaluating equipment needs and techniques that can best do the restoration work. The second step is to incorporate the conclusions of the evaluation into a plan that spells out the overall rehabilitation strategy. The plan will include the chosen technique(s) and related cost/benefit information, mapped details of the identified wetlands (most are in Volusia County), the schedule of work, and the approximate annual costs. The rehabilitation plan should be completed in fiscal year 2003. Then, full-scale work can begin, which may take 5 to 10 years to complete.

Creation of Shoreline Vegetative Habitats. Work to expand mangrove-planted shorelines will continue using the Riley Encase Mangrove method. Potential planting sites are identified and evaluated every year with a goal of conducting at least six plantings per year. To date, nearly 10,000 mangroves have been planted along several thousand feet of shoreline. All plantings will be monitored to determine success, and alternative planting methods can be assessed at any time. The long-term goal of this project is to establish mangroves along unvegetated shorelines (from Central through South IRL) determined to be severely eroding²⁶.

Preservation of Existing Wetlands – Land Acquisition. The main goal over the next five years is to acquire as many of the *Blueway*-designated wetlands as possible (8,000 acres and 600 parcels total). To achieve good progress toward this goal, adequate support services to the land acquisition process must be maintained. This support can

²⁶ Some spoil islands, in addition to mainland shorelines, have been chosen as sites for vegetative planting to improve habitat and shoreline protection. Consequently, the Districts have become involved with the Spoil Island Workgroup, organized by FDEP, and comprised of various public and private organizations to coordinate enhancement activities for any of the 137 spoil islands in the IRL. Activities include rehabilitation of wetland/upland functions and recreational enhancements.

be accomplished by budgeting sufficient funds to continue a support service contract to handle appraisals (such as the one that the SJRWMD had with The Nature Conservancy). Continued support by the counties and the Districts for *Blueway* acquisitions must be sustained.

Summary of Lagoon-wide Coastal Wetland Projects Planned for the Next 5 Years.

Please refer to Table 2-6 below for a summary list of the general strategies and projects that have Lagoon-wide application and are planned for the next 5 years (2002 – 2007).

Table 2-6. The 5-Year Plan List of Coastal Wetland Strategies and Projects that have Lagoon-wide Application

- | | |
|---|--|
| ➤ | Continuation of the reconnection of impounded wetlands |
| ➤ | Completion of the Wetlands Management Research Initiative and application of findings toward management of impounded wetlands |
| ➤ | Rehabilitation of dragline-impacted wetlands |
| ➤ | Continuation of REM mangrove plantings and the application of other innovative shoreline planting methods |
| ➤ | Continuation of the <i>Blueway</i> land acquisition program |
| ➤ | Districts' review of local comprehensive growth plans and amendments (especially as they relate to the coastal resources element) to ensure consistency with SWIM coastal wetland objectives |

Public Involvement and Education

Successful implementation of the IRL SWIM Plan is dependent on public support. Considering the fact that nearly 400 people move into the IRL basin every week, public support must be constantly cultivated through education. A public that is aware of the value of the IRL system and the threats to its ecological integrity and economic viability is more likely to understand and support efforts to restore and protect it.

The *Public Involvement and Education* (PIE) program has been fully managed by the IRLNEP since 1994. Through the IRLNEP's exceptional efforts, public awareness, support, and involvement have grown steadily. The IRLNEP carries out the program's mission in a number of ways. IRLNEP provides informational material, guidance, and financial assistance to several public and private organizations for educational outreach programs. These organizations, along with IRLNEP, also offer opportunities for the public to be directly involved in some small-scale, resource enhancement projects. Major examples of PIE projects and activities are highlighted below.

Progress on Projects

Seminars and Workshops. A series of seminars and workshops, held twice a year in each of the Lagoon's counties, provide a forum for the public to learn and discuss current issues affecting the IRL. The Marine Resources Council (MRC) is currently contracted to organize and host these events.

In addition, the IRLNEP supports the *Indian River Lagoon Symposium*, a conference that was held in 1997 and in 2000. This publicly attended conference includes presentations and posters by many of the entities and individuals involved in monitoring and restoring the health of the IRL system.

Citizens' Water Quality Monitoring Network. Through a renewable contract with the MRC, a citizen's water quality monitoring network has been in operation for many years. Staffed by citizen-volunteers, this network monitors approximately 100 sites throughout the IRL on a weekly basis. This project is an opportunity for residents to participate in the collection of data, and to gain first-hand knowledge about the IRL. Both the IRLNEP and the Districts assist the MRC and volunteers in the interpretation of the data.

Shoreline Mangrove Plantings. The multi-agency, mangrove-planting project, coordinated by the Indian River County Environmental Learning Center, invites citizen-volunteers to provide needed manpower. Using a planting method developed by an IRL resident (Robert Riley; www.mangrove.org), the volunteers have planted red mangroves at dozens of sites throughout the Central and South IRL. Please refer to the previous section, Coastal Wetlands, *Creation of Shoreline Vegetative Habitats*, for more information about planting methods and project progress.

Informational Materials. Several K - 8th grade materials and other informational items were revised and updated in recent years. These include the *Indian River Lagoon Coloring Book*, targeted at grade school children, and the *Indian River Lagoon Activity Book*, a curriculum for middle school students. In addition, a brochure promoting the IRL license plate was recently completed, and the *Fragile Balance* informational brochure is being revised.

The IRLNEP's *Indian River Lagoon Update* newsletter is published quarterly, providing current information about the IRL and projects undertaken to protect and restore the Lagoon. The newsletter has a distribution list of more than 4,000 names with additional copies available at government offices, libraries, and through a variety of groups and organizations.

Indian River Lagoon License Plate. A brief history on the process for state adoption of the IRL "snook" license plate is found in the 1994 IRL SWIM Plan, p. 87. The IRL license plate was first issued to the public in February 1995. The plate has proven to be quite popular, with more than 40,000 sold and generating more than \$2 million in revenue since 1995. The revenue from all plates, regardless of where they are sold, returns to



the IRL region where it is distributed among the Lagoon's counties based on the proportion of IRL tags sold among those counties. The revenue supports IRL restoration and education projects.

The IRL "snook" plate has proven to be a significant public awareness icon, creating a great deal of public interest in the IRL, particularly among

residents of the region. An important outreach activity is promoting the IRL license plate by informing the public about how the plate revenue is used.

The Next 5 Years

All projects described above are planned to continue over the next 5 years (Table 2-7).

Table 2-7. The 5-Year Plan List of Public Involvement and Education Projects
<ul style="list-style-type: none"> ➤ Continue the regular public seminar forums to inform and elicit feedback on IRL issues and projects ➤ Promotion of volunteerism in monitoring and restoration activities (e.g., shoreline mangrove planting and Citizens' water quality monitoring projects) ➤ Continue development of new informational materials and the updating of existing publications ➤ Continue participation in fairs, festivals, and other public events to increase awareness of the IRL's resources and efforts to protect and restore them ➤ Continue promotion of the IRL "snook" license plate ➤ Continue participation with the IRL Spoil Island Workgroup as one means to elicit public involvement in various IRL management and monitoring activities

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